ZooKeys 303: 23–31 (2013)
doi: 10.3897/zookeys.303.5309
www.zookeys.org

RESEARCH ARTICLE

A peer-reviewed open-access journal
ZooKeys
Launched to accelerate biodiversity research

Two new species of oribatid mites of the genus *Truncozetes* (Acari, Oribatida, Epactozetidae) from Ecuador

Sergey G. Ermilov[1,†], Dorothee Sandmann[2,‡], Franca Marian[2,§], Mark Maraun[2,|]

1 *Tyumen State University, Tyumen, Russia* **2** *Georg-August-University Göttingen, J.F. Blumenbach Institute of Zoology and Anthropology, Göttingen, Germany*

† *urn:lsid:zoobank.org:author:89063E86-8DB6-4477-9F4E-6E0DA7E3BCBB*
‡ *urn:lsid:zoobank.org:author:9B52EC8E-ACDA-40ED-AAF7-F9A7024938EA*
§ *urn:lsid:zoobank.org:author:D8AFFFE0-F030-49D1-8023-37D714A1F827*
| *urn:lsid:zoobank.org:author:68CFE4F1-462F-4E3A-A579-732C9C57404C*

Corresponding author: *Sergey G. Ermilov* (ermilovacari@yandex.ru)

Academic editor: *Vladimir Pesic* | Received 11 April 2013 | Accepted 16 May 2013 | Published 21 May 2013

urn:lsid:zoobank.org:pub:76CA4D53-FC88-46A6-A7B7-5B27B6F5EC4B

Citation: Ermilov SG, Sandmann D, Marian F, Maraun M (2013) Two new species of oribatid mites of the genus *Truncozetes* (Acari, Oribatida, Epactozetidae) from Ecuador. ZooKeys 303: 23–31. doi: 10.3897/zookeys.303.5309

Abstract

Two new oribatid mite species of the genus *Truncozetes* (Oribatida, Epactozetidae), *T. ecuadoriensis* **sp. n.** and *T. monodactylus* **sp. n.**, are described from the Ecuadorian soils. The morphology of the gnathosoma and the legs is presented in detail for the first time for the species of *Truncozetes*. An identification key to all known species of the family Epactozetidae is given.

Keywords

Oribatid mites, Epactozetidae, *Truncozetes*, new species, key, Ecuador

Copyright *Sergey G. Ermilov et al.* This is an open access article distributed under the terms of the Creative Commons Attribution License 3.0 (CC-BY), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Introduction

Epactozetidae is a small oribatid mite family of the superfamily Achipterioidea (Acari, Oribatida), comprising of two genera (*Epactozetes* Grandjean, 1930, *Truncozetes* Balogh and Mahunka, 1969) and five species, which are distributed in the Neotropical region.

Epactozetes is a genus that was proposed by Grandjean (1930) with *Epactozetes imitator* Grandjean, 1930 as type species. Currently, this genus comprises two species: *Epactozetes imitator* Grandjean, 1930 (see Grandjean 1930) and *E. setosus* Balogh and Mahunka, 1969 (see Balogh and Mahunka 1969b). The main diagnostic characters of this genus are (summarized from Balogh and Balogh 1988, 1992; with our opinions): lamellae as long as prodorsum, fused or connected medio-anteriorly; genital plates with five pairs of setae; leg tarsi with three claws.

Truncozetes is a genus that was proposed by Balogh and Mahunka (1969a) with *Truncozetes mucronatus* Balogh and Mahunka, 1969 as type species. Currently, this genus comprises three species: *Truncozetes mucronatus* Balogh and Mahunka, 1969 (see Balogh and Mahunka 1969a), *T. rugosus* Mahunka, 1998 (see Mahunka 1998) and *T. sturmi* Balogh, 1984 (see Balogh 1984). The main diagnostic characters of this genus are (summarized from Balogh and Mahunka 1969a; Balogh and Balogh 1988, 1992; with our opinions): lamellae shorter than prodorsum, well separated, connected by translamella; notogaster with large posterior tubercle; genital plates with five to six pairs of setae; leg tarsi with one or three claws (one species with monodactylous legs I and tridactylous legs II–IV).

During taxonomic identification of the Ecuadorian oribatid mite fauna, we discovered two new epactozetid species belonging to the genus *Truncozetes*. The main purpose of this paper is to describe and illustrate these species under the names *Truncozetes ecuadoriensis* sp. n. and *T. monodactylus* sp. n. The morphology of the gnathosoma and the legs is presented in detail for the first time for the species of the genus *Truncozetes*.

An identification key to all known species of the family Epactozetidae is provided.

Materials and methods

Specimens were mounted in lactic acid on temporary cavity slides for measurement and illustration. Body length was measured from the side, i.e. from the tip of the rostrum to the posterior edge of the ventral plate. Notogastral width refers to the maximum width in dorsal aspect. Lengths of body setae were measured from the lateral side. All body measurements are given in micrometers (μm). Formulae for leg setation are given in parentheses according to the sequence trochanter–femur–genu–tibia–tarsus (famulus included). Formulae for leg solenidia are given in square brackets according to the sequence genu–tibia–tarsus.

General terminology used in this paper follows that summarized by Norton and Behan-Pelletier (2009).

Descriptions of new species

***Truncozetes ecuadoriensis* sp. n.**
urn:lsid:zoobank.org:act:DF076204-3191-4390-89C5-D356720287A0
http://species-id.net/wiki/Truncozetes_ecuadoriensis
Figs 1, 2, 5–17

Diagnosis. Body size 315–332 × 215–232. Translamella thin, straight. Sensilli with weakly barbed elongate-oval head. Five pairs of genital and two pairs of anal setae present. Leg tarsus I monodactylous, leg tarsi II–IV tridactylous.

Description. *Measurements*. Body length: 315 (holotype), 315, 332 (two paratypes); notogaster width: 215 (holotype), 215, 232 (two paratypes).

Integument. Body color brown. Surface covered by cerotegumental microgranules (visible under high magnification). Foveolae distinct, larger on pteromorphs (diameter up to 12).

Prodorsum. Rostrum widely rounded. Lamellae with lateral point anteriorly. Translamella very thin, straight. Rostral setae (*ro*) of medium size (41–45), setiform, barbed. Lamellar (*le*, 6–8) and interlamellar (*in*, 2–4) setae short, thin, smooth. Sensilli (*ss*, 53–61) with short stalk and weakly barbed elongate-oval, head. Exobothridial setae and their alveoli absent. Tutotia (*tu*) knife-form, with long and sharp cusps, reaching insertions of rostral setae.

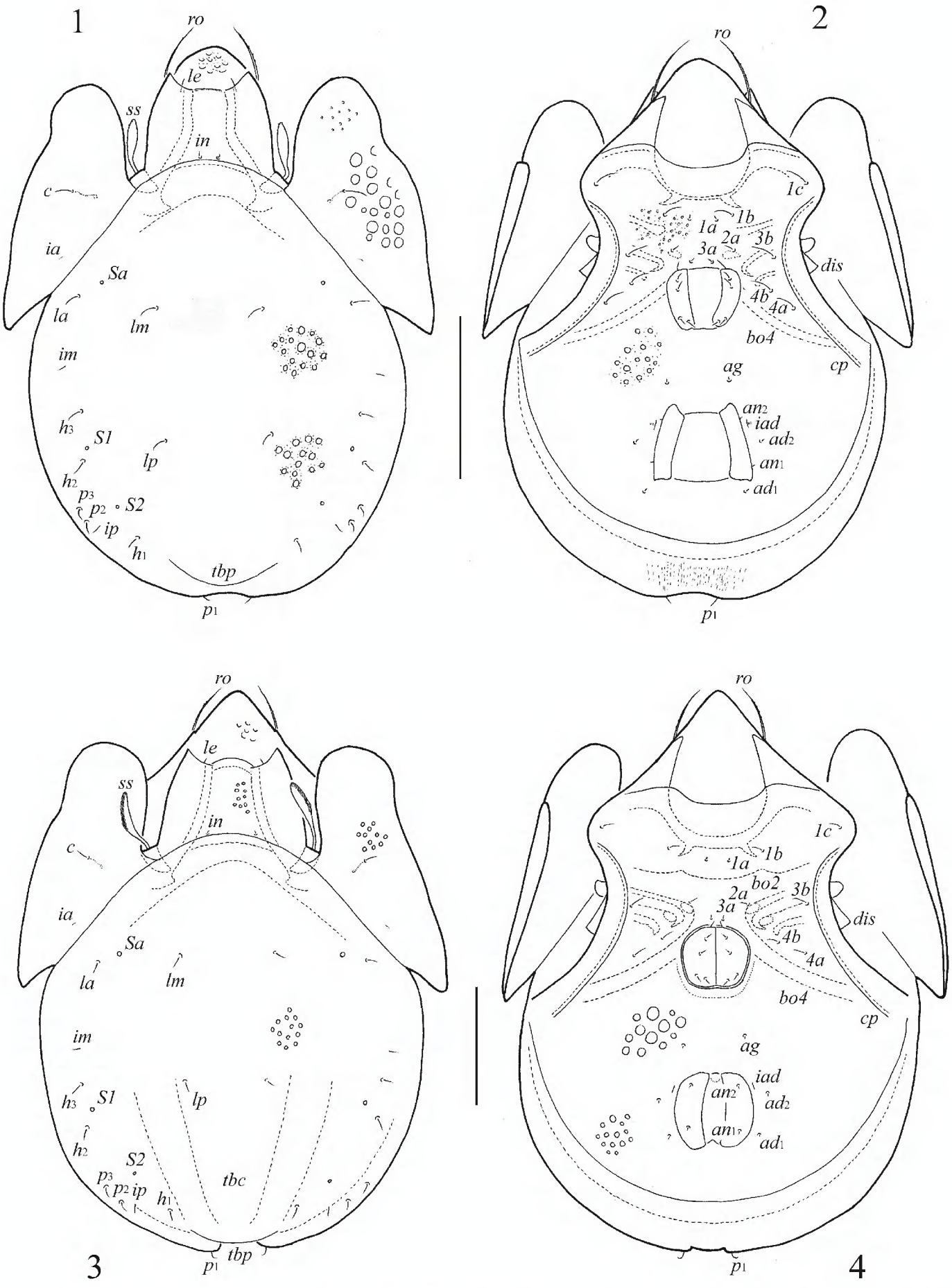
Notogaster. Weakly concave posteriorly. Posterior tubercle (*tbp*) poorly developed. Ten pairs of short (12–16), thin, smooth notogastral setae. Three pairs of small sacculi: *Sa* inserted antero-medially to setae *la*; *S1* – antero-medially to setae h_2; *S2* – antero-laterally to setae h_1. Lyrifissures *ia* located on pteromorphs, but poorly visible; *im* – antero-laterally to setae h_3; *ip* – postero-laterally to sacculi *S2*; *ih* and *ips* located in lateral positions. Opisthonotal gland openings not found.

Gnathosoma. Subcapitulum longer than wide (77 × 61). Subcapitular (*h*, *m*, *a*) and adoral (or_1, or_2) setae similar in length (12) setiform, smooth. Palps (61) with setation 0–2–1–3–9 (+ω). Solenidion (ω) thickened, straight, attached with eupathidium (*acm*). Chelicerae (77) with one setiform, barbed seta (*cha*, 24); possible *chb* also present, but we found only their alveolus in dissected specimen. Trägårdh's organ (Tg) long, elongate conical.

Epimeral and lateral podosomal regions. Apodemal border 4 (*bo4*) complete, wide, brownish. Epimeral setal formula: 3–1–2–2. Epimeral setae short, setiform, smooth; *1a*, *3a* (2) shorter than *2a* (8), *1b*, *1c*, *3b*, *4a*, *4b* (12–16). Discidia (*dis*) triangular. Circumpedal carinae (*cp*) distinct.

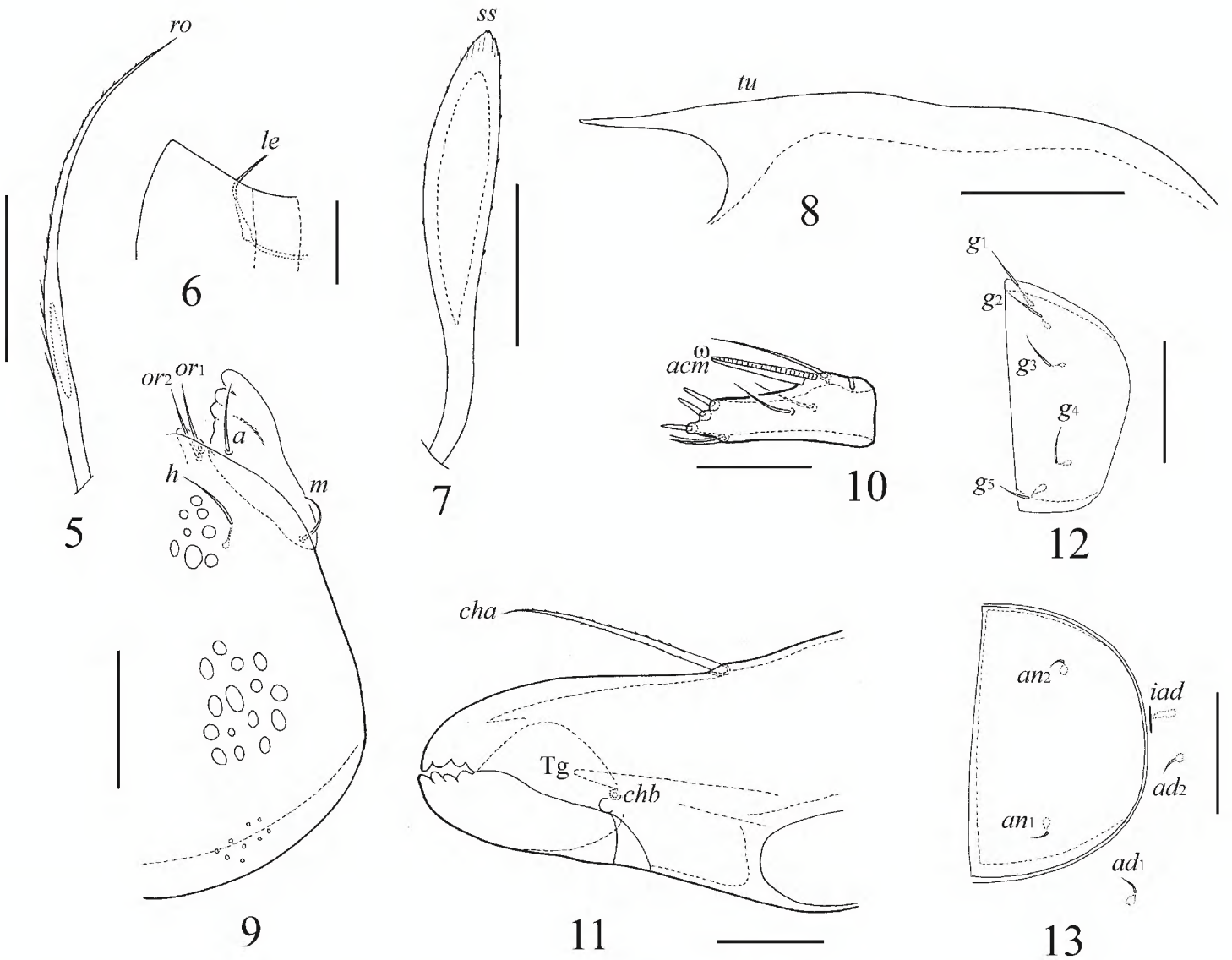
Anogenital region. Five pairs of genital (g_1–g_5, 8), one pair of aggenital (*ag*, 2–4), two pairs of anal (an_1, an_2, 2–4) and two pairs of adanal (ad_1, ad_2, 2–4) setae short, setiform, thin, smooth. Lyrifissures *iad* located in paraanal position.

Legs. Tarsus I with one claw, tarsi II–IV with three claws. Dorsal side of tarsus I and dorso-proximal part of tibia IV with strong thorn (*t*); antero-ventral side of genu I



Figures 1–4. *Truncozetes ecuadoriensis* sp. n. (1, 2) and *T. monodactylus* sp. n. (3, 4), adults. **1, 3** body dorsally **2, 4** body ventrally (gnathosoma and legs not illustrated). Scale bars: (1, 2) 100 μm, (3, 4) 50 μm. Abbreviations in text.

with small thorn; ventral side of tarsus I and tibia I with large tubercles (*tb*). Formulae of leg setation and solenidia: I (1–5–3–4–20) [1–2–2], II (1–5–2–3–15) [1–1–2], III (1–2–1–2–15) [1–1–0], IV (0–2–1–2–12) [0–1–0]; homology of setae and solenidia



Figures 5–13. *Truncozetes ecuadoriensis* sp. n., adult. **5** rostral seta **6** lamellar seta and anterior part of lamella dorsally **7** sensillus **8** tutorium **9** subcapitulum ventrally, left part **10** palptarsus laterally **11** anterior part of chelicera **12** genital plate, left **13** anal plate, left. Scale bars: (**5, 7–9, 12, 13**) 20 μm, (**6, 10, 11**) 10 μm. Abbreviations in text.

indicated in Table 1. Famulus (*e*) thin, straight, inserted anteriorly to thorn. Setae barbed (except smooth *p* and *s* on tarsus I). Solenidia ω_1 on tarsus I, ω_1, ω_2 on tarsus II, σ on genua III thickened, blunt-ended, other solenidia setiform.

Material examined. Holotype (male), two paratypes (male, female): Ecuador, 3°58'S, 79°50'W, Estación Científica San Francisco, 2000 m a.s.l., upper organic soil layer in mostly undisturbed rain forest, 01.04.2009, collected by F. Marian and D. Sandmann.

Type deposition. The holotype (in alcohol) is deposited in the collection of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia; one paratype (in alcohol) is deposited in the collection of the Siberian Zoological Museum, Novosibirsk, Russia; one paratype (dissected) is in the personal collection of the first author.

Etymology. The specific name "*ecuadoriensis*" refers to the country of origin, Ecuador.

Remarks. The new species is clearly distinguishable from other known species of the genus *Truncozetes* by the different number of leg claws (leg I monodactylous, legs II–IV tridactylous versus all legs monodactylous or tridactylous). Additional distinctive characters of a new species with the other species of the genus can be found in the identification key given below.

Table 1. Leg setation and solenidia of *Truncozetes ecuadoriensis* sp. n. (same for *T. monodactylus* sp. n.)

Leg	Trochanter	Femur	Genu	Tibia	Tarsus
I	*v'*	*d, (l), bv", v"*	*(l), v', σ*	*(l), (v), φ_1, φ_2*	*(ft), (tc), (it), (p), (u), (a), s, (pv), v', (pl), l", e, ω_1, ω_2*
II	*v'*	*d, (l), bv", v"*	*(l), σ*	*l', (v), φ*	*(ft), (tc), (it), (p), (u), (a), s, (pv), ω_1, ω_2*
III	*l'*	*d, ev'*	*l', σ*	*(v), φ*	*(ft), (tc), (it), (p), (u), (a), s, (pv)*
IV	-	*d, ev'*	*d*	*(v), φ*	*ft", (tc), (p), (u), (a), s, (pv)*

Roman letters refer to normal setae (*e* to famulus), Greek letters to Solenidia. Single prime (') marks setae on anterior and double prime (") setae on posterior side of the given leg segment. Parentheses refer to a pair of setae.

Truncozetes monodactylus sp. n.

urn:lsid:zoobank.org:act:C92C81FB-B822-44D3-899B-056490CC1C47
http://species-id.net/wiki/Truncozetes_monodactylus
Figs 3, 4

Diagnosis. Body size 232 × 166. Translamella concave medially. Sensilli with lanceolate head densely ciliated on dorsal side. Dorso-central part of notogaster with large tubercle. Five pairs of genital and two pairs of anal setae. All leg tarsi monodactylous.

Description. *Measurements*. Body length: 232 (holotype and paratype), 166 (holotype and paratype).

Integument. Body color brown. Surface covered by cerotegumental microgranules (visible under high magnification). Foveolae distinct, small (diameter up to 6).

Prodorsum. Rostrum narrowly rounded. Lamellae with lateral point anteriorly. Translamella thick, concave medially. Rostral setae of medium size (24), setiform, barbed. Lamellar (4) and interlamellar (2) setae minute. Sensilli (32) with short stalk and elongate-oval head, which is densely ciliate on dorsal side. Exobothridial setae and their alveoli absent. Tutotia knife-form, reaching insertions of rostral setae.

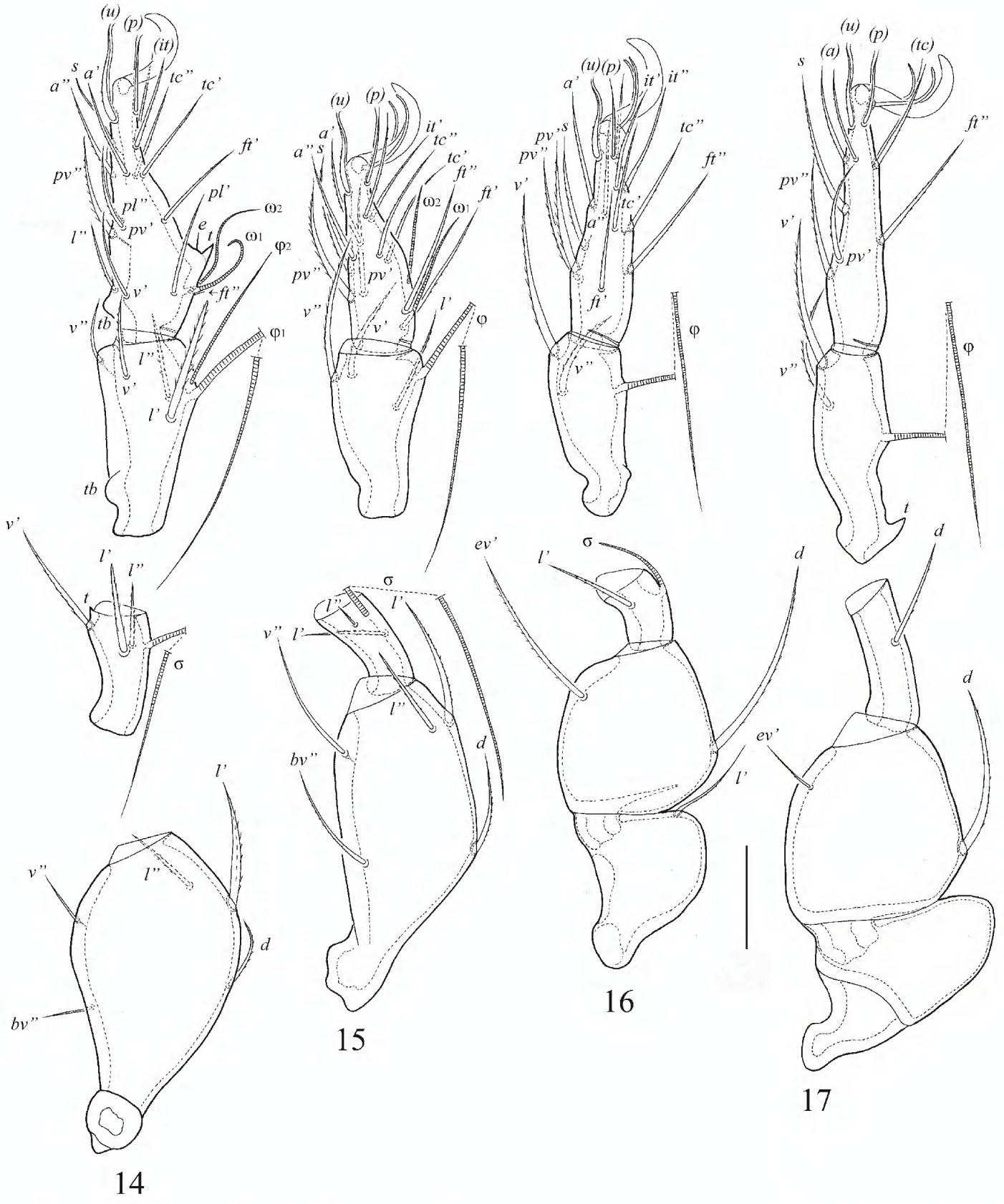
Notogaster. Concave posteriorly. Dorso-central part convex, with elongate hump-like tubercle (*tbc*). Posterior tubercle (*tbp*) well developed. Ten pairs of short (8–12), thin, smooth notogastral setae present. Three pairs of small sacculi visible, but *S2* poorly visible. Position of lyrifissures as in *Truncozetes ecuadoriensis* sp. n. Opisthonotal gland openings not found.

Gnathosoma. Similar to *Truncozetes ecuadoriensis* sp. n.

Epimeral and lateral podosomal regions. Apodemal borders 2 (*bo2*) and 4 (*bo4*) wide, fused medially, brownish. Epimeral setal formula: 3–1–2–2. Epimeral setae short, setiform, smooth; *1a*, *3a* (2) shorter than *2a* (4), *1b*, *1c*, *3b*, *4a*, *4b* (8). Discidia triangular. Circumpedal carinae distinct.

Anogenital region. Five pairs of genital (4), one pair of aggenital (2), two pairs of anal (2) and two pairs of adanal (2) setae short. Lyrifissures *iad* located in paraanal position.

Legs. Similar to *Truncozetes ecuadoriensis* sp. n., but all tarsi with one strong claw.



Figures 14–17. *Truncozetes ecuadoriensis* sp. n., adult. **14** leg I (without trochanter), right, paraxial view **15** leg II (without trochanter), left, antiaxial view **16** leg III, right, antiaxial view **17** leg IV, right, antiaxial view. Scale bar: 20 μm. Abbreviations in text.

Material examined. Holotype (female), one paratype (female): Ecuador, 3°70'S, 78°58'W, Bombuscaro, Podocarpus National Park, 1050 m a.s.l., upper organic soil layer in mostly undisturbed rain forest, 01.04.2009, collected by F. Marian and D. Sandmann.

Type deposition. The holotype (in alcohol) is deposited in the collection of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia; one paratype (dissected) is in the personal collection of the first author.

Etymology. The specific name "*monodactylus*" refers to the one claw on all leg tarsi.

Remarks. The new species is clearly distinguishable from other known species of the genus *Truncozetes* by the monodactylous legs (versus all legs tridactylous or leg I monodactylous, legs II–IV tridactylous). Additional distinctive characters of this species from other species of the genus can be found in the identification key given below.

Key to known species of Epactozetidae

1 Lamellae shorter than prodorsum, well separated, connected by translamella ..... **2 (genus *Truncozetes*)**

– Lamellae as long as prodorsum, fused or connected medio-anteriorly ..... **6 (genus *Epactozetes*)**

2 All leg tarsi with one claw; apodemal borders II and IV fused medially; body size: 232 × 166.... ***Truncozetes monodactylus* sp. n.** (Distribution: Ecuador)

– All leg tarsi with three claws or only leg tarsus I with one claw; apodemal borders II and IV not fused medially **3**

3 Leg tarsus I with one claw, leg tarsi II–IV with three claws; genital plates with five pairs of setae; body size: 315–332 × 215–232..... ***Truncozetes ecuadoriensis* sp. n.** (Distribution: Ecuador)

– All leg tarsi with three claws; genital plates with six pairs of setae **4**

4 Dorsal notogastral setae *lm* and *lp* inserted in lateral position of notogaster, approximately in one longitudinal row with setae *la* and h_3; distal part of sensillus dark; body size: 233–244 × 171–176 ..... ***Truncozetes rugosus* Mahunka, 1998** (Distribution: Antilles)

– Dorsal notogastral setae *lm* and *lp* inserted in dorsal position of notogaster; distal part of sensillus not dark..... **5**

5 Epimeral region with distinct longitudinal stria; sensillar heads densely barbed; body size: 228 × 168 ..... ***Truncozetes mucronatus* Balogh & Mahunka, 1969** (Distribution: Neotropical region)

– Epimeral region without longitudinal stria; sensillar heads smooth; body size: 308–336 × 176–185 ..... ***Truncozetes sturmi* Balogh, 1984** (Distribution: Neotropical region)

6 Lamellae fused medio-anteriorly; notogastral setae visible; body size: 235–270 × 180–235 ..... ***Epactozetes setosus* Balogh & Mahunka, 1969** (Distribution: Neotropical region)

– Lamellae connected medio-anteriorly; notogastral setae not visible; body size: 210–235 × 160 ..... *.....Epactozetes imitator* **Grandjean, 1930** (Distribution: Central America)

Acknowledgements

We cordially thank Prof. Dr. Badamdorj Bayartogtokh (National University of Mongolia, Ulaanbaatar, Mongolia) for valuable comments, and Dr. Jenő Kontschán (Hungarian National History Museum, Hungary) for help with in studying of the paratype of *Truncozetes sturmi* Balogh, 1984.

Oribatid mites were investigated as part of the Research Unit "Biodiversity and sustainable management of a megadiverse mountain ecosystem in South Ecuador", subproject "Soil fauna: Diversity and functioning" headed by Mark Maraun and Stefan Scheu; financial support by the German Research Foundation is gratefully acknowledged (RU 816).

References

Balogh J, Balogh P (1988) Oribatid mites of the Neotropical region. I. Budapest, Akadémiai Kiadó press: 335 p.

Balogh J, Balogh P (1992) The Oribatid Mites Genera of the World. Vol. 1. Hungarian National Museum Press, Budapest: 263 p.

Balogh J, Mahunka S (1969a) The scientific results of the Hungarian soil zoological expeditions to South America. 10. Acari: Oribatids, collected by the second expedition. I. Acta Zool. Acad. Sci. Hung. 15(1–2): 1–21.

Balogh J, Mahunka S (1969b) The zoological results of the Hungarian soil zoological expeditions to South America. 11. Acari: Oribatids from the material of the second expedition II. Opusc. Zool. Budapest 9(1): 31–69.

Balogh J (1984) New oribatid mites from Colombia II (Acari). Acta Zool. Hung. 30(3–4): 315–326.

Grandjean F (1930) Oribates nouveaux de la région Caraïbe. Bul. Soc. Zool. France 55: 262–284.

Mahunka S (1998) New data on oribatids (Acari: Oribatida) from St. Lucia (Antilles). Acarologica Genevensia LXXXIX. Rev. suisse Zool., 105(4):839–877.

Norton RA, Behan-Pelletier VM (2009) Oribatida. Chapter 15; p. 430–564. In: Krantz GW, Walter DE (Eds) A Manual of Acarology. Texas Tech University Press, Lubbock (TX).

Nübel-Reidelbach E, Woas S (1992) Einige basale Arten der cepheiden und der pterogasterinen Entwicklungslinie der Höheren Oribatiden (Acari, Oribatei). Andrias, 9: 75–119.